

UNIVERSITI TEKNOLOGI MARA

**Potential Immunomodulatory Effect of
Allium sativum oil and its Major
Component Allicin in the Disease
Process of Type 1 Diabetic Rats.**

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic or non-academic institution for any other degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulation for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Diabetes mellitus is one of the most common endocrine disorders accompanied by many metabolic syndromes. Many studies have examined the hypoglycaemic effect of *Allium sativum* oil and its major component allicin in both types of diabetes mellitus, but till now the mechanism has not been discussed regarding type 1 diabetes mellitus (T1DM). The objectives of this study were to determine the potential immunomodulatory effect of the administration of *Allium sativum* oil and its major compound allicin in the disease process of T1DM by assessing the levels of anti- islet cell antibodies, Pan T lymphocytes marker (CD90), Pan B lymphocytes markers (CD19), Pan innate cells marker (CD11b) and serum insulin. Method: Male Sprague-Dawley rats with Streptozocin (STZ)-induced T1DM were used. T1DM induced to overnight fasted rats by intraperitoneal injection with a single dose of STZ 65mg/kg body weight. The six groups (6 rats in each group) under study received different doses of *Allium sativum* oil and allicin. Blood glucose levels were tested every morning (at 8 am) through 30 days of the experimental period. At the end of the experiment, and after completion of the experimental protocols, blood samples were collected from overnight fasting rats by cardiac puncture under anesthesia. Serum was assayed for anti- islet cell antibodies, Pan T lymphocyte marker (CD90), Pan B lymphocyte markers (CD19), Pan innate cells marker (CD11b) and serum insulin using enzyme-linked immunosorbent assay (ELISA). Pancreatic tissues were taken from the rats for histology and they were fixed in 10%neutral formalin solution, Results: The results were compared to the ones obtained from healthy and non treated diabetic rats. The diabetic rats exhibited consistent hyperglycaemia and increased level of T, B lymphocytes markers, innate cells marker, and anti islet cells antibodies (ICA). There was a decrease in the serum insulin concentrations. Meanwhile administration of *Allium sativum* oil and allicin especially at high doses to the T1DM rats leads to significant decreases in the levels of all immunological parameters and increased serum insulin level. Conclusions: From this experiment it was observed *Allium sativum* oil and its major compound allicin exhibited immunomodulatory effect against autoimmune reactions in T1DM. The data provide new strategies for using *Allium sativum* and allicinto be recommended in the clinical management, control, and prevention of T1DM. In addition, our study suggested the possibility of using *Allium sativum* oil and allicin in the management of other autoimmune diseases.

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CHAPTER ONE

INTRODUCTION

1.1 GENERAL INTRODUCTION

Diabetes mellitus (DM) is one of the most common endocrine disorders accompanied by metabolic syndromes. DM is characterized by a loss of glucose homeostasis with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both (Phil.R and Ashraf.I, 2011). Diabetes affects 1-2 % of the populations and currently there are around 100 million diabetic patients world wide (Phil and Ashraf, 2011). Diabetes is characterized by hyperglycaemia and long time complications which affect the eyes, nerves, blood vessels, skin, and kidneys. Complications in some of these organs can lead to death (Brownlee, 2001; Weiss and Sumpio, 2006). A study carried out by Eidi et al., (2006) stated number of diabetics worldwide is 150 million and this is likely to increase to 300 or more by the year 2025. The reasons for this rise include increase in sedentary lifestyle, consumption of energy rich diet and obesity (Eidi et al., 2006).

Currently, Type1 Diabetes mellitus (T1DM) (previously called Insulin-dependent diabetes mellitus- IDDM) is considered to be an autoimmune disease characterized by insulin deficiency due to T-cell mediated damage of pancreatic cells. T1DM usually begins in childhood or in young adult years (Edem, 2009). Insulin is the only treatment for T1DM patients, and as it is a biochemical agent it leads to many side effects (Metwally, 2009). Synthetic hypoglycaemic drugs, which are currently the main form of treatment for T1DM have been shown to have unwanted side effects and high secondary failure rates (Baily., 2000; Erasto et al., 2005; Dey et al., 2002).¹In addition, these drugs are not affordable by the majority of people living in rural communities of developing countries such as South Africa because of their high cost (Baily, 2000). Due to the limitations of currently available antidiabetic pharmacological agents have prompted researchers all over the world to investigate alternative antidiabetic remedies. In particular, consideration